

PI: Sendil Rangaswamy, Ph.D.
Intelligent Automation, Inc.
Rockville, MD 20855

Institute of Simulation & Training
University of Central Florida
Orlando, FL 32826

Identification and Significance of Innovation

The comprehensive numerical HPC benchmark NMx suite benchmarks current and future high performance computing activities. The *HPC benchmark suite NMx* includes:

- dense and sparse unsymmetrical matrix problems faced in space aviation and problems in thermally driven structural response and radiation exchange
- implicit solution algorithms with production models and benchmarks for indefinite matrices and pathological cases
- configurations scaling for large systems distributed high performance system in shared, distributed and mixed memory condition
- available solvers in public and developed solvers for various computing architectures

Technical Objectives and Work Plan

- Selection of models with analytical solutions and implicit solution algorithms with indefinite and large sparse and dense matrix conditions
- Selection of problems with precision and round-off studies on serial and parallel machines
- Test implementation and demonstration of the problem set on selected cluster architectures and study wall clock performance with respect to the number of processors
- Comparison of solutions on serial and parallel hardware in different architectures
- Analyze and document the strengths, weaknesses, and limitations of the toolkits used together with recommendations

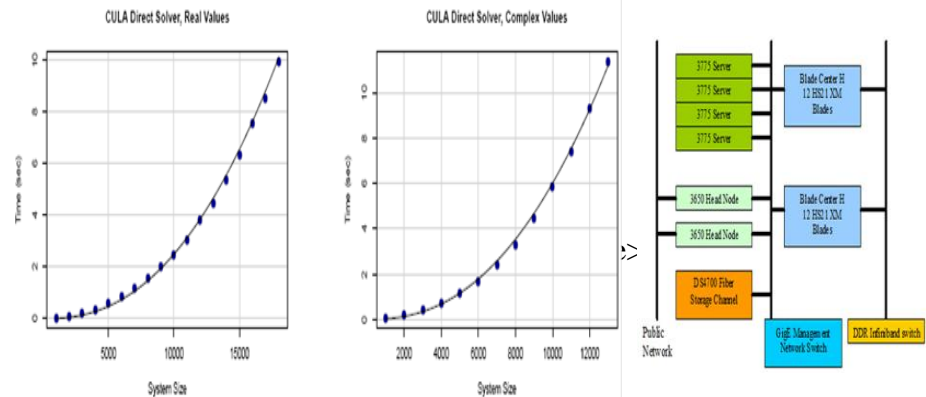


Figure: Experimentally observed times to use CULA implemented LU decomposition to find a solution for 100% dense matrix systems consisting of real values (left) and complex values (middle) on STOKES HPC and its hardware configuration is shown in the right

NASA and Non-NASA Applications

The most promising commercial applications are:

- heat transfer problems in structures in avionics, diagnostic of structures in space exploration and exploration of structure formation and problems in geology
- thermal and structural problems in industry, manufacturing sectors and military.
- Other applications include diagnostics and health monitoring applications.
- problems in large scale platforms for high performance simulations in CPU and GPU architectures for civilian use

Firm Contacts

Sendil Rangaswamy
sendilr@i-a-i.com
Tel: 301-294-4756